



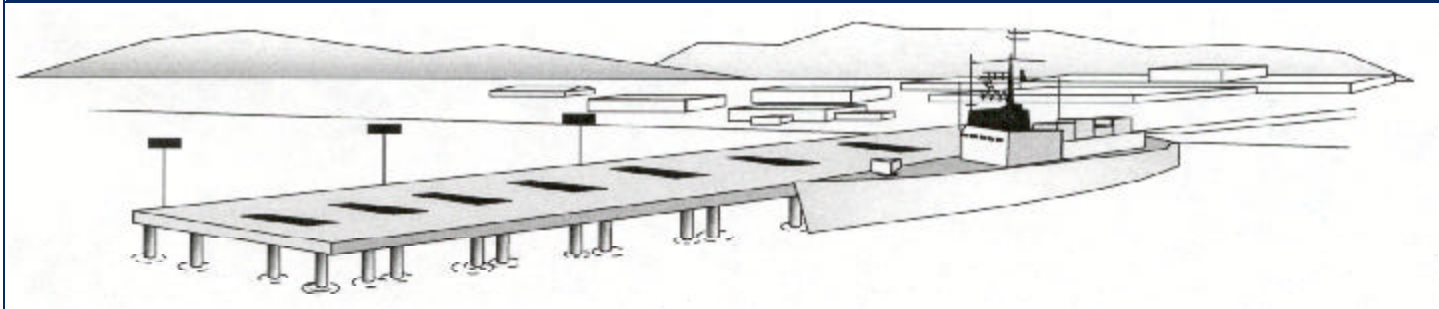
N F E S C

Naval Facilities Engineering Service Center
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On The Waterfront

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Volume 1.8



Airfield Pavement Void Detection Controls Operational Risks

On May 20, 1999, the nose landing gear of a T-34C aircraft punched through the pavement and fell into a 12-inch deep hole in a taxiway at NAS Pensacola. No one was hurt, but the drop damaged the plane's front gear and propeller. The pavement failed because leakage from a drainpipe under the taxiway had eroded away the local soil base and subgrade and left a void.

NAVFAC tasked NFESC to determine the extent of potential voids near all drainpipes under the runways, taxiways and aprons at NAS Pensacola. NFESC engineers **Dr. Javier Malvar** and **Greg Cline**, in cooperation with **Jim Lesto** and **Will Beverly** from NAVFAC Southern Division (SOUTHDIV), assessed the airfield pavements above drainpipes. They found several other areas with loose subgrades, and some with actual voids. Since the voids present a risk of severe injury and property damage, they are Category II hazards under the definitions of Operational Risk Management (ORM). The NFESC and SOUTHDIV engineers used destructive and nondestructive techniques to detect the voids, assessed the reliability of each technique, and published a report describing the results. The most deficient areas were quickly repaired.

NAVFAC also tasked NFESC to prepare an Interim Policy and Technical Guidance (IP&TG) to insure that the problem is addressed

at all Navy and Marine Corps airfields. NFESC and the Tri-Service Pavement Group used the NAS Pensacola report as a foundation to prepare and deliver the IP&TG. The Tri-Service Pavement Group is the Navy leading technical group for airfield pavements. It includes representatives from all **NAVFAC Engineering Field Divisions**, **NAVFAC HQ**, **NAVFAC Public Works** and **Criteria Office, U.S.**

Army (Waterways Experiment Station - WES, Geotechnical Branch), and Air Force (Air Force Civil Engineer Support Agency - AFCESA, and Air Force Research Laboratory - AFRL). **Dr. Get Moy**, NAVFAC's chief engineer issued the IP&TG, on March 23, 2000.

Our void detection web page (<http://intranet.nfesc.navy.mil/apvdt.htm>) describes the work on Airfield Pavement Void Detection tech-

nology and includes copies of related reports. The page is on the NFESC Intranet, so access is limited to users whose IP address specifies them as members of the .mil domain.

This work was funded by NAVFAC HQ (through **Barin Chakrabarti** in **Public Works**) and the **OPNAV N44** Real Property Management Demonstration/Validation (DEMVAL) program.

For additional information contact Dr. Javier Malvar, ESC63 at DSN 551-1447, commercial (805) 982-1447, or malvarlj@nfesc.navy.mil.



A T-34C aircraft takes an unexpected detour into a 12-inch deep hole on the taxiway.

Chemists Smooth Transition to Commercial Specifications

Changes in the way the Navy uses specifications have changed the steps required to specify paints and coatings. Federal Specifications are being replaced by references to commercial standards. **Dan Zarate**, of our Waterfront Materials Division, in cooperation with **Joe Brandon**, **Jim Crawford**, and **Calvin Crofford** of NAVFAC Atlantic Division (LANTDIV), and other Government and industry experts, is working to smooth the transition.

Federal Specifications specify how to make or manufacture a product. Federal Specifications typically specify the formulas for paints and coatings, and often include performance requirements. The General Services Administration (GSA) is the Preparing Activity for many of the Federal Specifications for Naval facility paints and coatings. OMB Circular A-119 directs each Federal organization to review all Federal and Military Specifications and if feasible, eliminate them by either converting them to Commercial Item Descriptions (CID) or referencing commercial or consensus standards. A CID describes the performance requirements without imposing formulation requirements.



Effective coating selections reduce costs by providing coatings that last longer and require less maintenance.

To ensure that Navy operations receive and use quality products, the paints and coatings referenced in the architectural NAVFAC Guide Specification (NFGS-09900, Paints and Coatings) have been cross-referenced to commercial standards. The Navy has selected the standards from the Master Painters Institute (MPI) as replacements for the architectural paint specifications used in NFGS-09900. MPI has developed a series of paints and coatings specifications

that closely parallel the Federal Specifications referenced in NFGS-09900.

MPI has developed two types of specifications - Detailed Performance Specifications and Intended Use Specifications. Products listed under a Detailed Performance Specification are tested to the requirements of the specification and are validated on a periodic basis. This list then serves as a qualified products list. Products listed under an Intended Use Specification are not tested. The products are listed by comparing product literature to the intended use and the

listed requirements, if any. To meet Navy requirements, MPI has agreed to make changes in their specification requirements and will convert some Intended Use Specifications to Detailed Performance Specifications. The next revision of NFGS-09900, currently scheduled for release in October 2000, will incorporate the cross-referenced standards. More will follow as MPI converts the Intended Use Specifications to Detailed Performance Specifications and products are qualified. To contact MPI call Barry Law at (604) 298-7578. MPI is located in Burnaby, British Columbia. You can also visit the MPI web site at "www.paintinfo.com."

NFESC is the designated Naval Public Works technical consultant for paints and coatings. Dan Zarate and other NFESC chemists can help you select the best paints and coatings for your job. A full listing of the Federal Specifications cross referenced to MPI specifications is available through our web site at "www.nfesc.navy.mil/shore/esc63/pwtc/coatings/coatings.htm."

NFESC is also home of the Navy's designated Public Works technical consultants for other technology areas: roofing, cathodic protection, pavements, trackage, elevators, direct digital controls (HVAC), boiler plants, and waterfront structures. You can find out more about these technology areas by visiting "www.nfesc.navy.mil/shore/esc63/pwtc.htm."

For more information, please contact Dan Zarate, ESC63, at DSN 551-1057, commercial (805) 982-1057, or zartateda@nfesc.navy.mil.

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MCON P-341 Bremerton Pier D Replacement

NFESC engineers are working with **EFA North West (EFANW)**, **Moffatt & Nichol Engineers**, and their subcontractors to develop Request for Proposal (RFP) documents for the FY2001 **MCON P-341 Pier D Replacement**, at **NAVSTA Bremerton, Washington**. The Moffatt & Nichol team is developing the basis of design, specifications, and design concepts that will comprise the RFP package that will go out for design/build proposals. The NFESC team is providing technical consultation to EFANW and Moffatt & Nichol Engineers to keep them informed of advanced technologies that are sufficiently tested and can be implemented in the Pier D project.

This project is an excellent opportunity for NFESC to introduce new technologies developed for the **Office of Naval Research (ONR)** and **CNO N44**, into the MCON process. **Duane Davis** is providing guidance on fender system design based on his recent work in advanced fendering. **Dr. George Warren** and **Doug Burke** are providing guidance based on recent work with composite materials for waterfront upgrades and technologies for marine concrete. **John Ferritto's** work on seismic design of waterfront facilities for the **NAVFAC Criteria Office** and the **California State Lands Commission** has also been incorporated into the guidance.

The NFESC team participated in the first submittal review in February and is anticipating the next review. The following NFESC members also contributed to this effort: **Greg Cline**, **Dave Gaughen**, **Bill Seelig**, **Howard Nickerson**, and **Bob Odello**. **Ron Lavoie**, the



EFANW Project Manager, **Jay Malmo**, Staff Civil Engineer, Bremerton Naval Complex, **Paul Goetz** the ALnO for NAVSTA Bremerton, and **Preston Springston** the NFESC Shore Facilities Program Manager, were key players in bringing this cooperative effort together.

For more information, please contact Preston Springston, ESC60PM, at DSN 551-1225, commercial (805) 982-1225, or springstonps@nfesc.navy.mil.

MILCON Construction Standards Increase Protection

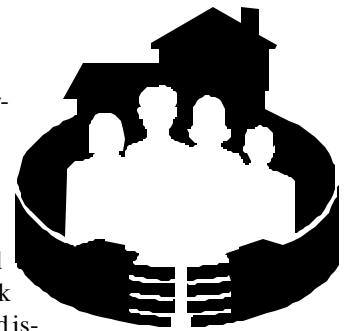
In December 1999, the DOD Joint Staff mandated the use of Anti-Terrorism/Force Protection (AT/FP) Construction Standards for certain types of inhabited buildings acquired through FY2002 and later MILCONs. The DOD Security Engineering Working Group (SEWG) led the effort. Several players throughout DOD participated in SEWG activities to develop the AT/FP Construction Standards. Navy engineers and physical security experts from NFESC, including **Mitch Hardin**, **Ray Escobedo**, and **Steven Hoag**, participated in their development. They collaborated with **Charles Mandeville** from the **NAVFAC Criteria Office**, **Jane Brattain** from **USMC Headquarters**, and Army, Air Force, and Joint Staff architects and engineers. The second stage of the effort, currently underway, is to expand the AT/FP Construction Standards to include retrofit and facility projects that are not MILCON projects, and add additional minimum construction standards and cost guidance for other types of buildings.

The NFESC members worked with SEWG to develop and conduct training workshops for MILCON programmers, architects, and engineers throughout DOD. Over 70 programmers, architects, and engineers from NAVFAC Engineering Field Divisions and Activities attended. The training showed them how to implement standards. Three workshops have been conducted to date. Workshop materials include briefings outlining the AT/FP Construction Standards and detailed example MILCON problems that demonstrate their application.

NFESC Security Engineering personnel also provide field assistance to Navy design divisions and activities to help them interpret the AT/FP Construction Standards and economically apply them to Naval facilities. They also take feedback about implementation problems and issues to the SEWG and work with other service members to continually improve the AT/FP Construction Standards and their use.

The minimum standards apply to all MILCON construction projects for high occupancy structures. Facilities covered by the AT/FP Construction Standards include billeting, administration, din-

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If you have any comments or questions, suggestions for future articles, or would like to receive copies of **On the Waterfront**, call or write to **Joe Connett**, Code ESC60APM, (805) 982-1570; DSN: 551-1570; FAX: (805) 982-3481, or Email: connetja@nfesc.navy.mil.



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ing, medical, auditorium, chapel, gymnasium, and theater facilities. The AT/FP Construction Standards cover threats from vehicle bombs, ballistic, and placed bombs for those facility types. The AT/FP Construction Standards help facilities easily adapt buildings so they provide protection for personnel in the event an elevated THREATCON is implemented. The AT/FP Construction Standards require perimeter standoff distances for inhabited structures. The cost of added real estate required to provide the standoff distances is significant. However, the Joint Staff is sticking to their guns and has mandated that AT/FP Construction Standards be met.

In addition to providing minimums, the AT/FP Construction Standards include cost guidance for providing higher levels of protection and protection against elevated threats. The cost guidance was specifically designed for programmers to use during the development of MILCON paperwork for elevated conditions.

The DOD began the effort to create the AT/FP Construction Standards in 1998. The effort began as a result of a directive from the

DOD Joint Staff to the SEWG and included the production of minimum AT/FP Construction Standards and cost guidance for providing protection against terrorist attacks. The first stage of the effort was to develop interim guidance by the close of FY99. The AT/FP Construction Standards apply to all MILCON projects for construction of high occupancy structures.

Although information has been available for enhancing structures to protect them against terrorist acts of aggression, this is the first time that DOD has mandated that AT/FP construction enhancements be incorporated into facilities. This represents a huge commitment on the part of the DOD to protect its personnel and a whirlwind effort on the part of the SEWG. This effort has been a great example of how DOD service components can work together to produce

criteria. Joint efforts help to minimize cost and maximize benefits to the DOD.

For additional information, please contact Ray Escobedo, ESC66, at DSN 551-1565, commercial (805) 982-1565, or escobedora@nfesc.navy.mil.



Anti-terrorism construction standards will reduce the threat from attacks like the 1996 terrorist bombing of Kobar Towers.

DOD Approves HP Magazine

The Department of Defense Explosives Safety Board (DDESB) at its semi-annual meeting on January 27, 2000, by unanimous vote, approved the siting criteria for the High Performance (HP) Magazine. Specifically, it approved the additions to sections of DOD Standard 6055.9 that added siting criteria (Inhabited Building Distances, Intra-Line Distances, Intra-Magazine Distances, and Public Traffic Route Distances) and a functional description of an HP Magazine. This decision represents formal DDESB approval of the body of data generated by the 8-year test program and 3 successful full-scale certification tests. Additionally, DDESB directed the Army to add HP Magazine Sensitivity Group data for all DOD ammunition to the Joint Hazards Classification System (results of NFESC and NSWC ordnance reaction/sensitivity tests). DOD 6055.9 references the "definitive design" produced by the NFESC. The definitive design specifies the structural and architectural features of an HP Magazine that are pertinent to explosives safety and thus cannot be modified without approval.

The DDESB memorandum approving the changes is published on the DDESB Home Page at "www.hqda.army.mil/ddesb/esb.html" (see Recent Policy, 319th Board Meeting).

On April 6, 2000, the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) approved the HP Magazine for storage of sensitive arms, ammunition, and explosives as



defined in DOD Directive 5100.76-M. The HP Magazine uses the Internal Locking Device (ILD) developed by the NFESC for the DOD. An independent analysis showed that the ILD, and other facility hardening systems specified by NFESC's **Craig Horton**, enable the HP Magazine to provide at least a 10-minute delay to forced entry using unlimited hand and limited (battery operated) power tools and limited (less than 1,200°F) thermal tools.

NFESC's **Jim Tancreto** is currently working with **David Ichinose** and **Mark Shimabukuro** (PACDIV), **Bill Granderson** and **John Clements** (MCAS Iwakuni) and **Jim Miller** (ACOE Japan) on the siting, design, and construction of two HP Magazines as part of the Iwakuni Runway Relocation Project funded by the Government of Japan. The HP Magazine facility acquisition package includes a basis of design, the definitive design, 35% facility design drawings (produced by **LANTDIV**), 100% locking system drawings, specification for an overhead bridge crane (produced by the **Navy Crane Center**) and a specification and drawings for a "universal straddle carrier" (produced by the **Naval Packaging, Handling, Storage and Transportation Center**). The universal straddle carrier is an attachment used by the bridge crane to lift all ordnance that will be stored within an HP Magazine.

For further information contact Jim Tancreto at DSN 551-1180, commercial (805) 982-1180, or tancretoje@nfesc.navy.mil.

NAVFAC Experts Plan for Future Management of Naval Roofs

On March 14 and 15, 2000, members of NFESC and other NAVFAC commands held a meeting in Port Hueneme, California to discuss Naval roofing. Discussions centered on how the Navy presently manages roofs and future methods that NAVFAC could employ to better assist Naval customers in managing their roofs.

CAPT Robert Westberg, NFESC's Commanding Officer, opened the meeting. CAPT Westberg emphasized the importance of roofing to the Navy and encouraged the team to find and implement solutions to improve Naval roofing. **Mark deOgburn**, of NFESC's Shore Facilities Department, led the meeting. He's the Navy's designated Public Works Technical Consultant for Roofing. Other participants included **Dennis Talton**, **Calvin Crofford**, **Scott Cooper**, **Rick Jarvis**, and **Les Toler** from LANIDIV, **Steve Beals** from SWDIV, and **Don Brunner**, **Joe Connett**, and **Preston Springston** from NFESC.

The team reviewed the many current problems and future challenges in management of Naval roofs. Requirements include:

- Development and implementation of a comprehensive Navy-wide Roof Program that would provide continuity throughout the NAVFAC Corporation.
- Additional roof criteria for the transition to design-build construction of Naval facilities.
- Management of roofing for design and construction, and public works functional capabilities, not just public works functional capabilities.

Increased interdependence among the elements of the NAVFAC Corporation in management of roofing issues.

The team identified potential means to meet these challenges. The first steps include:

- Development and establishment of policy to ensure that we use only the best roofing systems available.
- Establishment of policy that will require the use of registered roofing consultants and inspectors for large roofing projects.
- Revisions to Navy Criteria to adopt commercial standards and criteria in Military Handbook 1001/5 (Roofing and Waterproofing), and NAVFAC MO-113 (Maintenance and Repair of Roofs Manual).

The downsizing of NAVFAC and the increased interdependence among NAVFAC commands requires reassignment of roofing responsibilities. NAVFAC has assigned lead responsibility to NFESC, but it became clear during the discussions that effective roof man-



Meeting participants (from left to right) Joe Connett, Dennis Talton, Steve Beals, Les Toler, Scott Cooper, Rick Jarvis, Calvin Crofford, and Don Brunner. (Not shown: Mark deOgburn and Preston Springston)

agement requires continued participation from EFDs, PWCs, and activity personnel in day-to-day roofing matters. Future meetings will include additional members of the Navy community, and will address acceptable roofing systems.

For additional information, please contact Mark deOgburn, ESC63, commercial (843) 820-7047, or deogburnm@nfesc.navy.mil.

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Pop Goes the Camel

The unexpected failure of a hydromatic floating fender (also known as a camel) exposed the **USS Portsmouth (SSN 707)** to danger. The camel was installed at Pier 5003 at the Naval Submarine Base, San Diego, California. It failed suddenly, tearing into two approximately equal pieces. Each was 11 feet in diameter and over 12 feet long. One rolled over on its side and floated. The other sank to the bottom.

Senior Chief Nobles who was on deck when the camel failed, described the weather at the time as “squall like.” No one on deck saw the failure, but they did hear a sudden exhalation of air.

When the camel failed it was less than 20 months old. Fortunately, the submarine wasn’t damaged. However, the camel failure presented a puzzle - why did this relatively new camel fail?, and what could be done to ensure that the same thing didn’t happen again? An investigation by **NFESC** Shore Facilities engineers and material scientists led to the identification of possible causes of the failure.

They also used the results of the investigation to develop guidelines to improve the integrity of current fenders and means to enhance the performance of new ones.

The camel was one of a new type that had recently entered U.S. Navy service. The camels are large, cylindrical elastomeric cushions, inflated with air to 7 psi, and are typically 11 feet in diameter and 32 feet high. They are held upright by interior water ballasts and a suspended ballast weight. Submarine loads on the camel are transferred to steel plates, which bear against prestressed fender piles. The Fleet favors this design because it provides the required pier offset, is resilient, has considerable reserve capacity for absorbing berthing impacts, is manufactured of materials which are resistant to degradation in the marine environment, and does not damage the submarines.

With help from **Michael Bloom**, **SUBASE San Diego** **ALnO**, **Dave Hoy** and **Dan Polly** of **NFESC**’s Shore Facilities Department made an initial visit to inspect the ruined camel. Their investigation provided enough information for **PWC San Diego** and the **NAVFAC Criteria**

Office to task **NFESC** to investigate the failure.

NFESC’s inspection of the camel showed several possible causes for the tear that led to the failure. There were voids in the elastomeric camel skin. Consequently, some of the nylon filaments were not fully enveloped within the elastomeric material. Tensile tests conducted by **Robert Jamond** and **John Crahan** of **NFESC**, showed that skin sections containing many voids had strengths up to 50 percent lower than sections with few voids. **Dr. Javier Malvar**, Senior Materials Engineer, developed finite element analysis models of the camel to determine the actual stresses in the skin during

loading. **Dr. Malvar**’s analysis showed that the loading conditions on the camel could lead to buckling that result in sharp stress concentrations in the form of camel skin kinks. **NFESC**’s **Duane Davis**, the **NAVFAC** technical consultant for Waterfront Facilities, and **Dr. Malvar** were able to use results of the investigation to develop recommendations to decrease the threat of camel failure.

They recom-

mended reducing the weight of the hanging ballast and the internal camel pressure. For new fenders they also recommend using a tapered, rather than uniform, cylinder for the camel shape and evaluating the use of a thicker skin.

For more information on the camel failure and recommendations for increased camel safety, see the analysis report “Hydropneumatic Submarine Fender Failure, SSR-2478-SHR” on the Shore Facilities Web Page File Cabinet at “www.nfesc.navy.mil/shore/filecabinet.html.” You can also contact either **Dr. Javier Malvar**, ESC63, DSN 551-1447, commercial (805) 982-1447, or malvarlj@nfesc.navy.mil, or **Duane Davis**, ESC62, DSN 551-1248, commercial (805) 982-1248, or davisda@nfesc.navy.mil.



In this case, half a camel is no better than none.



New Fenders Meet Submarine Requirements

On June 17, 2000, a "Seawolf" submarine docked at Pier 15 of SUBASE New London, Connecticut. It nestled against two first generation prototype "Universal Submarine" camels developed by the NFESC. **Duane Davis** was the project lead, **Steve Meagher, Public Works** at SUBASE, New London, coordinated the work on site. These camels are manufactured of composite materials that give an extended service life of over 20 years as compared to steel camels that typically require extensive maintenance at 5 years. The Universal Sub Camel is designed to prevent contact with wide aperture arrays on submarines. The installation and operational testing of this new camel is a timely response to letters issued by SUBLANT and PEO Submarines in February 2000 stating an urgent requirement for fenders to protect wide aperture arrays (WAA) of Virginia and Los Angeles Class submarines and for NAVFAC approved camel designs for use with Los Angeles, Improved Los Angeles, Seawolf, and Virginia class submarines. The new camel was developed under the NAVFAC RDT&E program in coordination with the NAVFAC Waterfront Criteria Office. The installation at New London was co-funded by the NAVFAC RDT&E program and SUBASE New London. MAR was the prime contractor for delivery of the camels and they were fabricated by Hardcore Composites. The performance of the new camel will be evaluated during the Seawolf's in-port stay.

An article in the Fall 1998 issue of **On the Waterfront** described



Composite fenders safely support the Seawolf.

the design basis for the camel and other initiatives for use of composites to reduce the cost of waterfront operations. It is available at "www.nfesc.navy.mil/shore/otw.htm."

For more information contact Duane Davis, ESC62, at DSN 551-1248, commercial (805) 982-1248, or davisda@nfesc.navy.mil

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On The Waterfront

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